

Computer-aided Designing and Computer-aided Machining Fabricated Complete Dentures: An Overview

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Recent development in the field of prosthodontics has led to the advancement in technology with fabrication of complete dentures through computer-aided designing and computer-aided machining (CAD/CAM). Usually for the fabrication of conventional complete dentures, five clinical appointments are necessary, but the CAD/CAM systems generally need two appointments. In the first appointment, impressions, interocclusal records, and tooth selection can be completed; and in the second appointment, the dentures are fabricated using CAD/CAM technology and placed in oral cavity.¹

Conventional complete dentures have been used since more than 100 years but the conformity between denture-bearing tissues and denture base was always obstructed by the polymerization shrinkage of the resin. The shrinkage causes distortions of the denture base and has a negative effect on fit and retention of the dentures. Current CAD/CAM dentures had some important benefits over it. The CAD/CAM dentures have improved denture fit with reduced processing errors, due to the reduction in residual monomers and improved physical properties of the acrylic resin denture base with less adhesion of *Candida albicans* to the denture base. The number of times patient visiting the clinic is also reduced, and the remanufacturing of a broken or lost denture is more simplified due to the digital storage of denture data.^{1,2}

Elder had stated that record bases should adapt to the basal seat area as the finished denture base and should have the border form similar to the finished denture and rigid enough to withstand the masticatory forces. They should be dimensionally stable, may be used as bases for setting up teeth, should be inexpensive, can be fabricated easily and quickly, and have no undesirable color.³ The fabrication of CAD/CAM dentures follows the subtractive manufacturing process with the milling of the denture bases from fully polymerized acrylic resin pucks, with more accurate denture bases with reduced shrinkage or distortion. Steinmass et al. had generated CAD/CAM dentures provided by four different manufacturers (AvaDent, Merz Dental, Whole You, and Wieland/Ivoclar) from 10 different master casts. Denture fabricated from conventional technique was kept as the control. They found that CAD/CAM dentures had significantly higher tissue congruence compared to the conventional dentures.⁴

Kanazawa et al. in 2011 evaluated the denture fabrication with CAD/CAM system and found it to be more accurate with an average deviation of 0.10 mm for the mucosal surface and 0.50 mm for the occlusal surface.⁵ The first clinical report of the fabrication of CAD/CAM denture was published by Goodacre et al.⁶ Srinivasan et al. had compared the time spent clinically and the costs incurred in constructing complete dentures using CAD/CAM and conventional method. They found that digital denture fabrication is less costly as compared to the conventional complete dentures. Although the material cost in fabrication of CAD/CAM denture was higher

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but other costs such as expenditure for clinical chairside time, laboratory, and the overall costs were significantly lower.⁷

The limitations with CAD/CAM dentures are challenges involved while making impressions, difficulty in establishing occlusal vertical dimension and in transferring maxillomandibular relation, and inability to define the mandibular occlusal plane. Some systems had no provision of trial dentures, due to which it is difficult to validate function, esthetics, comfort, and patient acceptance before the final denture.⁸ The other drawbacks are balanced dentures are difficult to achieve with the digital software due to which a clinical remount is required to balance the denture teeth.⁹

It can be anticipated that the denture fabricated digitally may show better clinical retention with reduced traumatic ulcers due to denture trauma, which may be highly beneficial to the elderly and the compromised edentulous patients. The clinical procedures will be definitely more comfortable with less number of clinical visits in affordable costs. Further clinical research are required to overcome the drawbacks of the CAD/CAM dentures which is a must to validate this treatment modality prosthodontically.

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